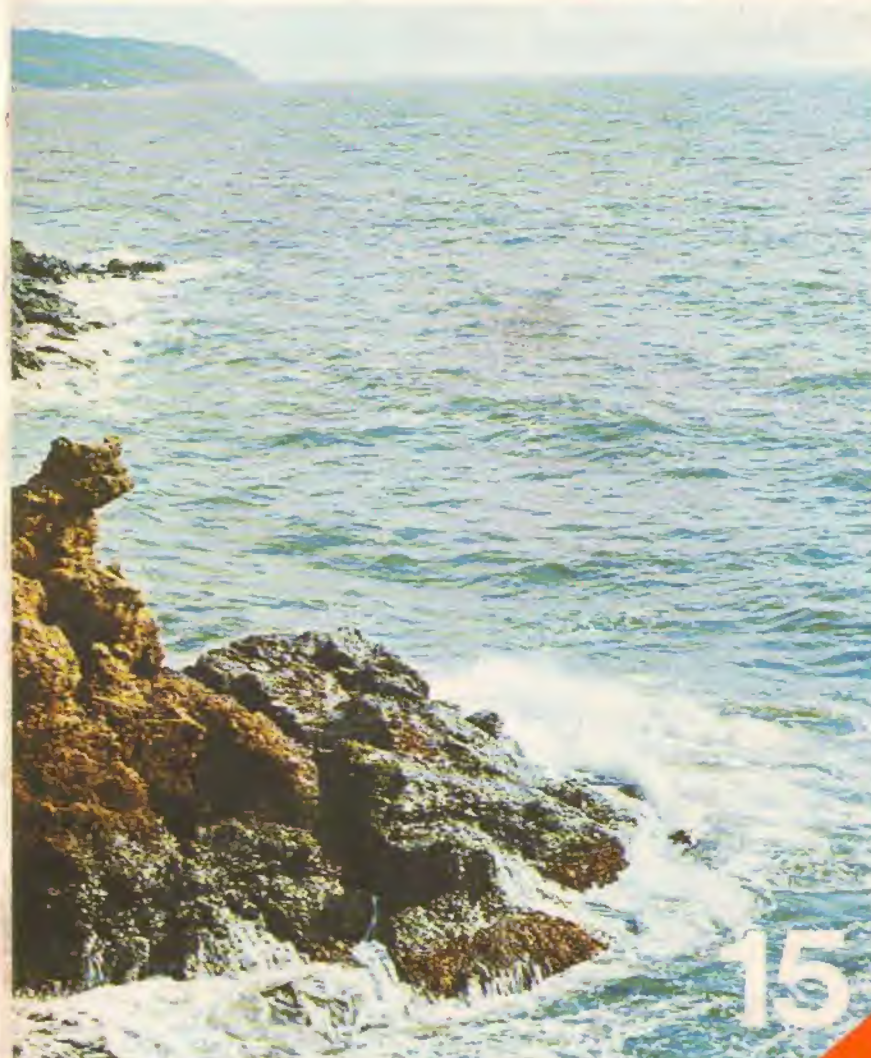
BASIC SCIENCE SERIES



LIFE IN THE SEA

REVISED EDITION

CONTENTS

INTRODUCTION

The sea occupies a greater area of the Earth's surface than the land. It is the home of millions of living things. Animals and plants of various shapes, colours and sizes live in the sea. Do you know that there is more life in the sea than on land?

The animals and plants of the sea are very important to Man as a source of food. Sea animals like lobsters, crabs, fishes and many shellfishes can also be eaten. Some sea plants, like seaweeds, are also used as food.

If you ever go skin diving, a scene like the one below might meet your eyes.

An underwater scene

THE SEASHORE

The seashore is the place where the land meets the sea. At certain times of the day the level of sea water rises. When this happens we say that it is **high tide**. When the level of sea water goes down, it is **low tide**. The area of the seashore between the high tide mark and the low tide mark is called the **intertidal region**. Many kinds of unusual plants and animals live in this region.

The level of sea water rises and falls with the tide.

Various types of seaweeds

PLANTS OF THE SEASHORE

The plant life of the shore consists mainly of different types of **algae**. Two forms of algae exist — the drifting algae and the fixed algae. The drifting algae are very small. Many of them consist only of one cell. However they can still grow like any ordinary plant by taking in water, minerals and carbon dioxide. The fixed algae or **seaweeds** are big algae. They have different colours — green, greenish-blue, red, brown or yellow. Algae grow best on sunlit shores.

Algae have been considered to be the most important of all plants because they provide food for millions of sea animals. They can also be eaten by Man.

ANIMALS OF THE SEASHORE

If you walk along a rocky seashore at low tide, you will find tiny crabs scuttling away to hide under stones, rocks or seaweeds. Look carefully at the rocks and you will find many tiny animals firmly attached to them. These little animals are called **barnacles**. They have white-coloured shells that are shaped like tiny tents with openings at the top. Barnacles spend their adult lives fastened to one spot. Not all barnacles are attached to rocks. **Gooseneck barnacles** fasten themselves onto driftwood or the bottom of ships.

Each barnacle has several short feathery arms which jerk in and out, swirling the water and bringing food into its mouth.

Rock barnacles

Gooseneck barnacles

Mussels are another kind of sea animal which attach themselves to rocks. They have two, dark-coloured shells that fit together. They are known as bivalves. Mussels get their food from

These shellfishes are found on rocky shores.

sea water which they filter by means of special tubes. Crawling about among the mussels are many **dog whelks** and **limpets**. They look like snails and feed mainly on barnacles. The dog whelks have spiral shells. In the larval stage the limpets have spiral shells but these soon become flattened into conical-shaped shells when the limpets grow into adults. Most of them have a hole at the top of their shells.

Another type of sea snail which you can often see on rocky seashores are the **periwinkles**. They normally grow to about 2·5 cm in length but their tongue has almost 4,000 teeth on it. Although the periwinkle has so many teeth, it eats only plants, especially seaweeds.

These worm-like animals live on sandy shores.

The animals of the sandy and muddy shores are slightly different from those found on rocky shores. On many sandy shores we can find various types of **worm-like animals**. Some of them, for example the **parchment worms**, live in U-shaped burrows. Others, such as the **trumpet worms**, build a complete tube around their bodies from grains of sand and broken shells. Crabs also live on sandy shores. They hide themselves by burrowing into the sand.

Cockles are found in large numbers on sandy shores. The places where they live together are called cockle beds. Like the mussels, cockles are also bivalves and feed by filtering sea water by means of special tubes. **Clams** are another type of bivalve. They make their homes by burrowing into the sandy shore.

Cockles are bivalves.

Sea anemones are a colourful-looking group of sea animals. Certain types of sea anemone may be found on some sandy or muddy shores. When uncovered by the receding tide they look like coloured jellies growing on the shore. They trap animals for food with their many arm-like structures or tentacles. Most animals of the seashore have short lives but the sea anemone may live for 50 or 60 years.

Sea anemones are a colourful group of sea animals.

Corals are related to sea anemones. The corals we know are actually the skeletons of very tiny animals which live together. These animals are called **polyps**. Each polyp has a stem-like body and a number of tentacles at the top. The polyps live inside the skeleton. Each

Different types of corals

polyp often puts out its tentacles to catch its food. All corals are fixed to the sea-bed or rocks. They may be white, red, purple, yellow or green in colour. Some corals are soft and rubbery while others are hard and stony.

Things to Do

Make a trip to the beach at low tide. Collect as many different kinds of sea animals and plants as you can find.

Write down where you found each animal and plant. Take one of your sea plants and describe its colour, size and shape. Then draw a picture of the sea plant which you have described. Do the same for the other different types of plants in your collection.

Sort the animals into three groups:

(*a*) animals without shells,
(*b*) animals with one shell and
(*c*) animals with two shells.

Talk about the animals in each group.

LIFE ON THE SURFACE OF THE SEA — THE PLANKTON

Many tiny animals and plants float about on or near the surface of the water. These are the **plankton** and they represent the largest and the most varied group of life present in the sea. Most of them can only be seen with the help of a microscope.

PLANT PLANKTON

These are sometimes referred to as the "grass of the sea". They form the starting point for the life in the sea. It is these plants, that the very tiny animals in the sea feed on.

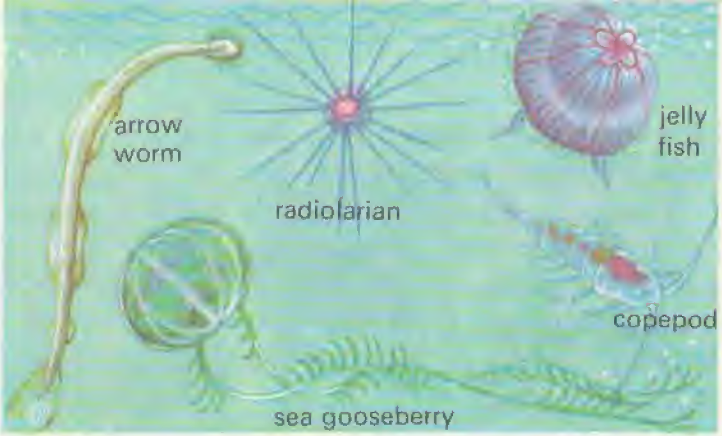
Many groups of plants make up the plant plankton. The **diatoms** form the biggest group. They are single-celled plants, enclosed in external skeletons which look like glass boxes. Diatoms have many types of shapes and colours. They all reproduce by simply dividing into two cells.

The **flagellates** are another large group which make up the plant plankton. They all have whip-like structures or flagellae which help them to swim.

Some examples of plant plankton

diatoms

flagellates



The animal plankton exist in a variety of forms

ANIMAL PLANKTON

The animal plankton are usually found in the same regions as the plant plankton because they feed on the plant plankton. The larvae of many invertebrates are included among the animal plankton. Like the plant plankton, they also exist in a great variety of forms and colours. The lowest forms of animal life in the plankton are the protozoa, an example of which is the **radiolarian**. The **Sea Gooseberry** and the **Arrow Worm** are other examples of planktonic animals. However the most important members of the animal plankton are the **copepods**.

Jellyfish in general may also be considered as a type of animal plankton. They look like little umbrellas. There are many short feelers around the edge of the umbrellas. These feelers have poisonous darts on them. The jellyfish use these feelers to catch their food as well as to protect themselves.

SEA PLANTS

The plant life of the sea consists almost entirely of various types of algae. Although they grow best on sunlit shores, some algae are found at depths of 60 metres in the sea.

Most of the plants that grow on the seabed are seaweeds. The largest and most familiar are the brown seaweeds. **Sargassum** is a brown seaweed which has a branched stem-like body with a flat disc. The disc is used for attaching the plant to any surface. They grow in places between the low and high tide marks. Some of them float on the water surface. They have air-bladders which help them to float.

Fucus and **Padina** are other types of common seaweeds. Red seaweeds grow at greater depths in the sea than the brown ones. Several of the red seaweeds have a coat of lime on them and are called **coral seaweeds**.

SEA ANIMALS

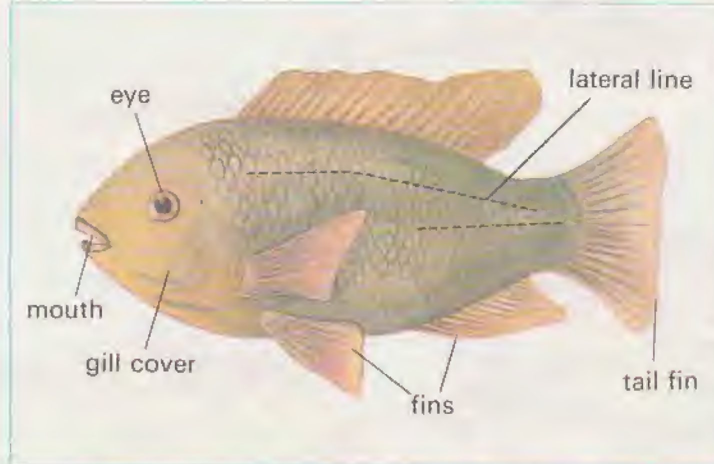
Animals of the sea range from tiny one-celled animals to huge mammals. The most well-known of all the sea animals are the **fishes**. The majority of them live in the shallow parts of the sea.

Even among the fishes there are great differences in colour, size and shape. The smallest fish, the **goby** is only 1·5 centimetres long while the largest fish, the **whale shark**, is over 15 metres long. The weight of fishes can range from a few grams to about 900 kilograms. Most fishes live only for a few months to a year.

Although fishes are so different, they have certain common features. All of them have special organs which help them to live in water. Let us see what these special organs are.

A whale shark
(actual size 170 times of this)

A goby
(actual size $\frac{1}{3}$ of this)

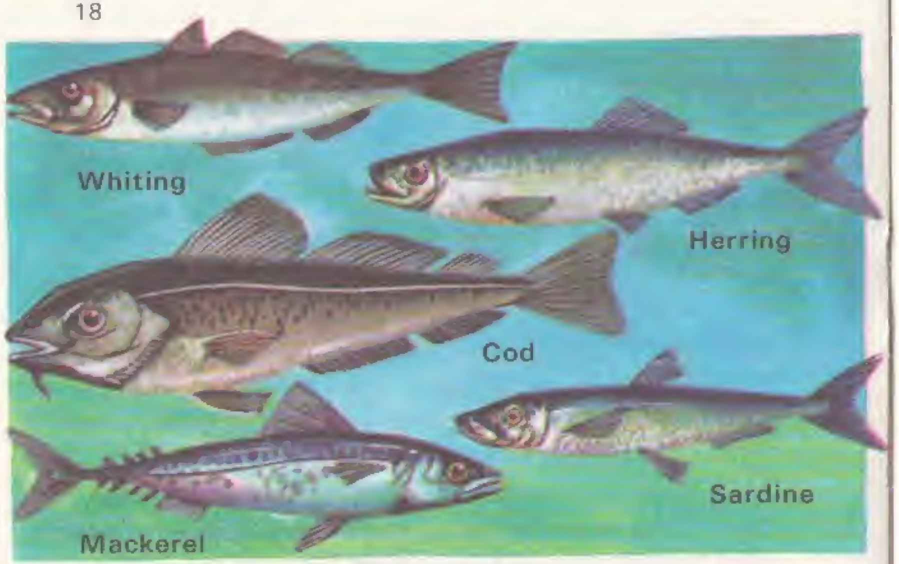


External features of a fish

Look at the picture of this fish. It has **fins**. The fins help the fish to swim in water. They also help the fish to steady and steer itself as it moves through the water.

The **gills** are comb-like structures on either side of its head. The fish breathes by swallowing water and passing the water over the gills. The gills absorb the oxygen from the water. The water then comes out of the openings on the sides of its head. These openings have covers, called gill covers, over them.

Most fishes also have **air-bladders**. These help the fish to float. All fishes have a line on either side of their bodies. It is called the **lateral line** and is used to detect sound vibrations and changes in water pressure.



Some of the common sea fishes that we eat are shown above — cod, mackerel, whiting, sardine and herring.

Scientists know a lot about fishes but there is still much to be learned. For example, do fishes ever sleep? Also, do fishes age? "To age" means that the body has stopped growing and is beginning to get weaker. Scientists are still trying to find the answers to these questions.

Things to Do

(i) We can make a home for fishes by making an **aquarium**. An aquarium is a place where water animals and water plants are kept. First you need a glass tank. Cover

the bottom of the tank with clean sand. Put some brightly coloured stones and shells on the sand. Place some water plants in the sand.

Water from the pond or stream can be used for your aquarium. You may also use tap water which has been standing in a pail overnight. Why? Do not pour the water from the pail. Pour it from a watering-can so that air can mix with the water. Do you know why there should be air in the water?

Let the aquarium stand for a day. When the water is clear you can put in the fishes. Put in fishes which are about the same size. Cover the aquarium with a

An aquarium

piece of wire netting. Place it near a window. An aquarium needs about two hours of sunlight each day. You must have fish food, too, which you can buy.

Observe how your fishes swim. Count the number of fins on each fish. How can you tell that the fishes are breathing?

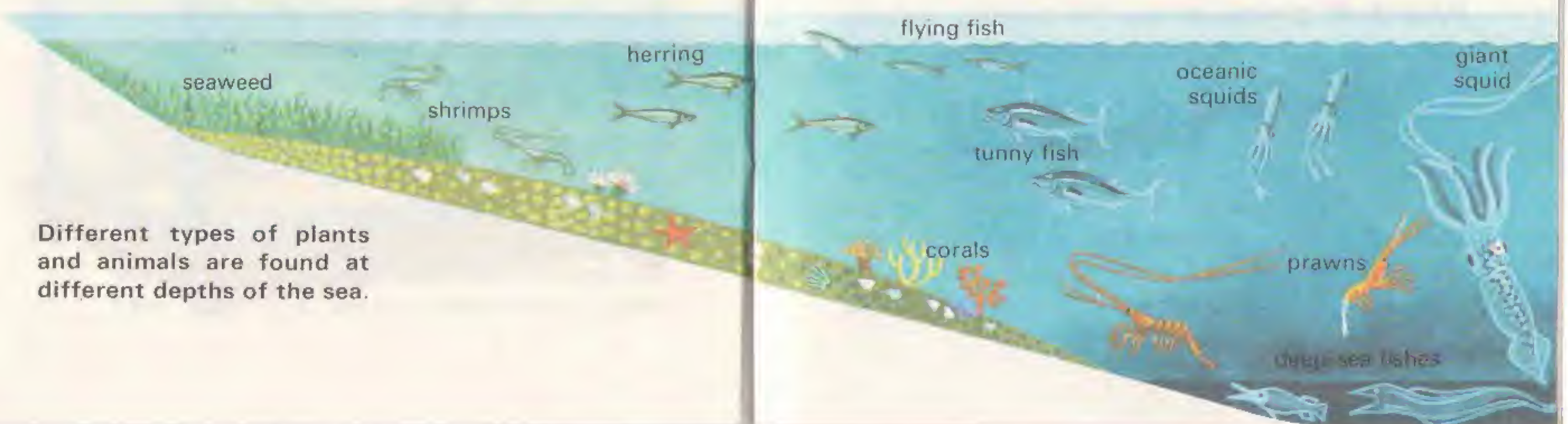
(ii) When you put fishes into the aquarium or take them out you should use a fish net. You can make a fish net easily.

Take a piece of thin cloth the size of a large handkerchief. Use a round plate to trace a circle on the cloth. Next cut along the line that you have traced. This will give you a circular piece of cloth. Take a piece of wire, bend it into a small circle and use the ends of the wire to form a handle. Sew the edge of the cloth around the circle of wire. Now you have a fish net.

ANIMALS OF THE SEABED

Besides fishes, there are many other types of sea animals. They include the **sponges**, **corals**, **lobsters**, **crabs**, **sea-stars**, **sea urchins** and **sea cucumbers**. Most of them live at the bottom of the sea, or on the seabed. The shallow seabed near the seashore is the best part of the sea for animal life. Sunlight reaches all the way down to the seabed and the waters are rich in mineral salts. Food of all kinds is also plentiful in this region.

As the sea gets deeper, the number of animals living on the seabed becomes less. Food is scarce because very little sunlight can reach the seabed and so no plants can grow in these depths. Also there is less food material falling from the surface layers of the sea. This is because most of the food material are either eaten up or become decomposed before they reach the seabed.



Different types of plants and animals are found at different depths of the sea.

Sponges

A shrimp

Hermit crabs

Sponges and corals

Sponges, like corals, are made up of very tiny animals which live together in groups or colonies. All these animals living together in one colony help to build up a single skeleton which is stiff and hard when dry and soft when wet. The skeleton is the sponge which is used for washing things and sometimes for bathing.

Corals are usually found on rocky shores but they can also be found on the seabed. The prettiest corals are found between depths of 30 and 45 metres below the sea.

Crabs, lobsters and shrimps

Crabs, lobsters and shrimps belong to a group of animals called the **crustaceans**. Lobsters and shrimps differ from crabs in that their bodies are long and end in fan-like tails. The crab's body is usually protected by a hard shell. The **Hermit crab** is interesting because it has no shell of its own. It protects itself by using the

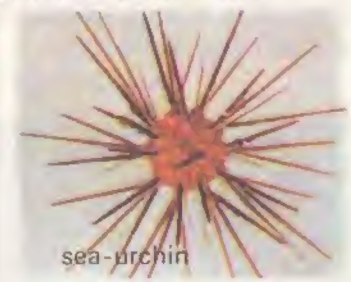
empty shell of a dead whelk. As the Hermit Crab grows bigger it has to look for a bigger shell to replace the old one.

Sea-stars, sea-urchins, and sea cucumbers

The sea-star, the sea-urchin and the sea cucumber belong to a small but interesting group of sea animals. Sea-stars are animals which look like stars because they have five or more short arms growing from the centre outwards. The body of a sea-star is soft and lies inside a hard covering. The coverings of some sea-stars are smooth while others have sharp spines sticking out of them. Sea-stars are of different colours and sizes. They can often be seen washed up on the shore, especially after a high tide.

Like the sea-stars, the sea-urchins live inside hard spiny shells. They do not have arms. Some of them are round, others are flat and some are heart-shaped. The spines on the shells contain poison. If you happen to step on a

These sea animals have hard, spiny shells.



A sea cucumber

Sea-horses

spiny sea-urchin you can get badly hurt.

Sea cucumbers are long hollow animals which have no skeletons. Some small ones may be 1 centimetre long and the larger ones may be as long as 30 centimetres. These animals usually crawl along the seabed or dig into the sand.

Sea-horses

The sea-horse is actually a kind of fish. Its body is made up of many bony rings. The sea-horse gets its name because its head looks like a horse's head. It has a tube-like mouth which it uses to suck in its food. It has a stiff tail for holding onto water plants. The sea-horse can only swim upwards and downwards in the water. It cannot swim sideways.

Octopuses, squids, and cuttlefish

These animals all belong to the same group. Squids and cuttlefish look rather alike. They have arms or tentacles, two of which are longer than the rest. These two tentacles are used for

A cuttlefish

An octopus

catching food. Octopuses have eight tentacles around their mouth. The tentacles are used for capturing animals for food and to fight off enemies.

ANIMALS OF THE DEEP SEA

Animals characteristic of the deep seas begin to appear below a depth of 4,500 metres. They include strange-looking fishes and many types of crustaceans e.g. shrimps and prawns. Most of them have light-producing organs to help them see in the deep dark waters. The fishes are fierce-looking and are meat-eaters. Many of them have huge mouths. The **black swallower**, for example, can swallow a fish which is bigger than itself. The **viperfish** has long needle-like teeth which hang out even when its mouth is closed.

Some deep-sea fishes

MAMMALS OF THE SEA

According to the theory of evolution, the earliest forms of life on this Earth started in the sea. Gradually certain kinds of animals left the water to live on land. Many, many years later some of these animals returned to live in the sea again. Examples of these animals are the **whales**, **seals**, **sea-lions**, **walruses**, **dolphins**, **porpoises** and **sea-cows**. They all belong to the most advanced group in the Animal Kingdom — the **mammals**. Man too belongs to this group. Nearly all of them are hunted by Man for their skin, meat and the oil in their bodies.

Whales are considered to be the biggest animals of the sea but this is only true of two species — the **Sperm Whale** and the **Blue Whale**.

Whales are the largest sea mammals.

Different types of sea mammals

Seals, sea-lions and walruses live both on land and in the sea. On dry land or on ice, they are very clumsy in their movements. But in the water they are graceful swimmers. All of them leave the water for the land or ice to give birth to their young.

The dolphins and the sea-cows are sea mammals. Dolphins and porpoises look alike but usually the dolphins are larger. These animals are mainly fish-eaters. Experiments show that dolphins are more intelligent than most other animals except the **primates** — a group of mammals including apes, monkeys and Man.

Dolphins can 'talk' to one another by whistling and grunting. They have been trained to perform many kinds of tricks.

THE FOOD CHAIN

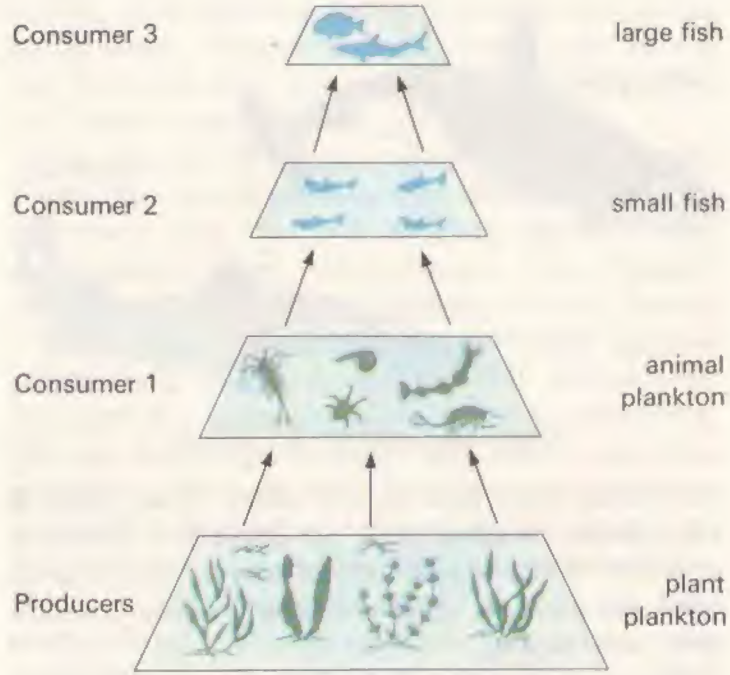
Those who have studied about life either on land or in the sea often talk about 'food chains'. Very simply it means that smaller animals are eaten by larger animals which, in turn, are eaten by still larger animals. The sequence of eating and being eaten forms a kind of chain since every plant or animal provides food for some other animal. In this way, the life of one organism is connected to the life of another just like the links of a chain.

In the sea, just as on land, plants form the starting point or the first link in the chain. The plant plankton can make food by using the energy from sunlight and by absorbing mineral salts from the surrounding water.

A food chain such as the one given below links some sea plants and animals together.

Plant →	Animal →	Small →	Large
plankton	plankton	fish	fish
e.g.	e.g.	e.g.	e.g.
diatoms	copepods	herrings	sharks

In this food chain the plant plankton are known as the **producer organisms** since they are able to produce and provide food for other



A food chain

organisms. The animal plankton and the fishes are known as **consumers** because they have to feed on or consume other organisms in order to survive.

DANGEROUS SEA ANIMALS

In every sea and ocean there are animals that are dangerous to Man. One of the most dangerous sea animal is the **shark**. There are about 30 kinds of sharks that are dangerous to Man. Their sizes vary from 1·5 to 6 metres long. Sharks

These sea animals are killers.

can move very fast in the water. They have a keen sense of smell and can smell the presence of blood hundreds of metres away. The shark's teeth are its most deadly weapon. They are very sharp and strong.

Next to the shark, the **barracuda** is considered to be the most dangerous salt-water fish in the sea. It can see very well in the water. Another dangerous sea animal is the **killer whale**. It will attack everything that moves and can leap out of water to capture its prey. Most seals are harmless but one of them, the **sea leopard**, is a killer.

SURVIVAL IN THE SEA

All living things, whether they live on the land or in the sea, must fight to stay alive, that is to **survive**. Each plant and each animal has

to feed on something and at the same time avoid being eaten. Therefore every plant and animal has to solve this big problem of staying alive in it's own way.

The danger of being eaten in the sea is great. Those plants and animals that do survive usually reproduce very fast and in great numbers. The single-celled plant, the diatom, can multiply itself into a billion new diatoms in one month.

Certain sea animals have defensive devices which help them to survive. The sea-urchins, for example, grow spines to protect themselves. The sea anemone and jelly fish have poisonous tentacles which are used for attack and defence.

Another method of survival which sea plants and animals use is disguise or **camouflage**. They usually have the same colour as their surroundings. The sargassum fish looks very much like the sargassum seaweed among which it lives. The sharks can hide themselves because

A sargassum fish

of their colouring. They are dark on top and silver on the underside and look like the colour of the water in which they live.

In order to stay alive, animals need to have keen senses. Fishes and some shellfish have sharp eyes. Almost all animals are sensitive to touch. Fishes detect movements in the water by means of their lateral lines. Fishes and other sea animals can hear well and many of them can make different types of warning sounds.

MAN'S FUTURE AND THE SEA

In the future you will be hearing more and more about the sea. It is one of the last remaining places on Earth which has not been fully explored by Man.

Today, more and more scientists are exploring the sea. This is because the population of the Earth is increasing so fast that very soon the land alone will not be able to provide enough food for everybody. That is why Man is turning to the sea. It is like a huge storehouse. It contains not only food but also many other valuable things such as oil and minerals. The sea can also provide us with a lot of fresh water.

Thus, if you have a taste for exciting adventures you may want to join the group of men whose work is to explore the mysteries of the deep sea.